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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/784,356	Applicant(s) SUISHU ET AL.
	Examiner Michael C. Krofcheck	Art Unit 2186

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 23 February 2004.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-40 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-18 and28 - 29 is/are rejected.

7)☒ Claim(s) 4,19-27 and 30-40 is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on February 23, 2004 is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date 8/19/2005.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

1. This office action is in response to application 10/784,356 filed on February 23, 2004.

2. Claims 1 – 40 have been submitted for examination.

3. Claims 1 – 40 have been examined.

Specification

4. The disclosure is objected to because of the following informalities:

a. In lines 1 – 10 of page 1 of the specification, the applicant incorporates the same foreign patent application twice, for which the current application is also claiming priority from. The preferred method of stating this is as follows, there is no need of stating it twice:

> "The present invention is related to and claims priority from Japanese Patent Application No. 2003-316183, filed on September 9, 2003, which is hereby incorporated by reference."

Appropriate correction is required.

Claim Objections

5. Claims 4, and 29 – 40 are objected to because of the following informalities:

b. Regarding claims 4 and 34, line 4 of each claim contains the phrase "update umber." That phrase should read, "update number."

c. Regarding claim 29, in lines 6 and 9, the phrase, "controls to stop wiring data," is used. It appears as if the applicant intended to say, "controls to stop writing data." It is the examiner's interpretation that by wiring, the applicant means writing.

d. Regarding claim 35, the dependent claim fails to refer to a preceding claim and refers to itself in error. It is the duty of the examiner to assume the broadest reasonable interpretation of the claims. Therefore the examiner assumes the applicant intended claim 35 to refer to claim 34.

e. Claims 30 – 33 and 36 – 40 are objected to because of their dependency.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. Claims 1 – 8, 10 – 18, and 28, 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakano et al., U.S. Patent Application Publication No. 2003/0051111 (hereinafter Nakano) and Wahl et al, U.S. Patent No. 6,324,654 (hereinafter Wahl).

8. With respect to claim 1, Nakano teaches of a data processing system comprising: a first storage system that is connected to a host device and sends and receives data to and from the host device (FIG. 5; paragraph 0061; paragraphs 0065 -

0066; where the host 1 transmits an instruction (data) to storage sub-system 1 (first storage system) and storage sub-system transmits a response back to host 1, showing that the storage sub-system 1 can send and receive data with the host 1);

a second storage system that is connected to the first storage system and receives data from the first storage system (FIG. 5; FIG. 1; paragraphs 0065 – 0066; paragraphs 0079 where the second storage sub-system exchanges data with the first storage sub-system through synchronous transmission showing that they are connected to each other and that the second storage sub-system can receive data from the first); and

a third storage system that is connected to the first storage system and receives data from the first storage system (FIG. 1; paragraph 0079; where the third data center or storage sub-system 3 and the first data center (storage sub-system 1) can exchange data through an asynchronous remote copying technique, therefore they are connected and the third center can receive data from the first),

wherein the first storage system includes a first storage area that stores data sent from the host device (FIG. 1; FIG. 2; paragraph 0100 – 0104; where data received from the host is temporarily stored in the cache and then transferred to the hard disk drive (first storage area) located in the storage sub-system 1), and

the second storage system includes a third storage area that stores data sent from the first storage system (FIG. 1; FIG. 2; paragraph 0100 – 0107; paragraph 0078 – 0080; where the storage sub-system 2 contains a channel adaptor for the exchange of data by a host or remote copy destination (first storage system), a cache memory used

for temporarily storing the data exchanged, and a hard disk drive (third storage area) where the data temporarily stored in the cache is written. The data sent to the hard disk drive (third storage area) is from storage sub-system 1 from a synchronous transfer operation shown in FIG. 1), and

the third storage system includes a fifth storage area that stores data read from the second storage area (FIG. 1; FIG. 2; paragraph 0100 – 0107; paragraph 0078 – 0080; where the storage sub-system 3 contains a channel adaptor for the exchange of data by a host or remote copy destination (second storage area), a cache memory used for temporarily storing the data exchanged, and a hard disk drive (fifth storage area) where the data temporarily stored in the cache is written. The data sent to the hard disk drive (fifth storage area) is from storage sub-system 1 from an asynchronous transfer operation shown in FIG. 1).

Nakano fails to specifically teach of (1) a second storage area that stores the data written in the first storage area and update information relating to the data written in the first storage area, (2) a fourth storage area that stores the data written in the third storage area and update information relating to the data written in the third storage area, (3) update information relating to the data read from the second storage area, (4) a sixth storage area that stores data that is generated based on the data written in the fifth storage area and the update information relating to the data written in the fifth storage area.

However, Wahl teaches of a second storage area that stores the data written in the first storage area and update information relating to the data written in the first

storage area (FIG. 1; FIG. 3; column 6, lines 41 – 57; column 7, lines 18 – 21; column 9, lines 12 – 40; where a writelog device (second storage area) that is a hard drive that is associated with each local data device (first storage area) that stores the modified data put on the local device (first storage area) and a header related to that data (update data)),

a fourth storage area that stores the data written in the third storage area and update information relating to the data written in the third storage area (FIG. 1; FIG. 3; column 6, lines 41 – 57; column 7, lines 18 – 21; column 9, lines 12 – 40; where a writelog device (fourth storage area) that is a hard drive that is associated with each local data device (third storage area) that stores the modified data put on the local device and a header related to that data (update data)), and

update information relating to the data read from the second storage area (FIG. 1; FIG. 3; column 6, lines 41 – 57; column 7, lines 18 – 21; column 9, lines 12 – 40; where a writelog device (fifth storage area) that is a hard drive stores the modified data put on the local device and a header (update data) related to that data), and

a sixth storage area that stores data that is generated based on the data written in the fifth storage area and the update information relating to the data written in the fifth storage area (FIG. 1; FIG. 3; column 6, lines 41 – 57; column 7, lines 18 – 21; column 9, lines 12 – 40; the data stored in the sixth storage area is no different then the data stored in the fifth area. They are merely copies of each other. It is obvious to one of ordinary skill in the art having one set of data on a hard drive to create a copy of that

data on another hard drive so that in the event of a failure, the second drive can be accessed for the data in place of the first drive (Wahl, column 1, lines 44 – 50)).

Nakano and Wahl are analogous arts as they are both in the same field of endeavor, remote data backup. It would have been obvious to one of ordinary skill in the art having the teachings of Nakano and Wahl at the time of the invention to modify the multiple storage sub-systems of Nakano to include the datastar device driver of Wahl into each controller within each storage sub-system, set aside a hard drive or hard drives inside each of the storage sub-systems of Nakano to store writelog data that is associated with the updated data stored in corresponding hard disks, and include the processes of reading, and writing them as described in Wahl. The motivation for this would have been to ensure that the data stored in the hard drives set aside for data (versus hard drives for writelog information) can be brought up to date (by the writelog information) in the event to a system crash, Wahl column 3, line 45 – column 4, line 3.

9. With respect to claim 2, Nakano and Wahl teach of all the limitations of the parent claim, as discussed supra. Nakano also teaches of wherein data writing in the first storage area in the first storage system is performed synchronously with data writing in the third storage area in the second storage system (FIG. 1, 2, 5, and 9; paragraph 0065 – 0067; paragraph 0079 – 0080; paragraph 0092; where when copying through the synchronous transfer of data is performed, the data in sub-system 1 constantly matches the data stored in sub-system 2. It is clear that the since data transfer to the first and second storage sub-systems is synchronous, that data transfer to the hard disks within storage sub-systems 1 and 2 (first storage area and third

storage area, respectively) is also synchronous being that the transferred data is stored therein).

10. With respect to claim 3, Nakano and Wahl teach of all the limitations of the parent claims, as discussed supra. Nakano also teaches of wherein the first storage system requests, upon receiving from the host device a data write request to write data, the second storage system to write the data therein (FIG. 5; paragraph 0065 – 0066; where the host issues a data update instruction, write instruction, and the storage sub-system 1 receives the updated data from the host and transmits it to the storage sub-system 2 as a request to write the data), and

notifies, after receiving a write response from the second storage system, the host device of a completion of the data write request (FIG. 5; paragraph 0065 – 0066; where after the data block has been written, the storage sub-system 2 notifies the storage sub-system 1 that the writing is complete via. a write-end status and the storage sub-system 1 subsequently notifies the host),

wherein the first storage system writes in the first storage area the data sent from the host device (FIG. 5; paragraph 0065 – 0066; where the data block is received from the host by the storage sub-system 1 and a write-end is returned to the host signifying the completion of the writing. Since the storage sub-system 1 acknowledges that is wrote the data, it is obvious that it did write the data), and

Nakano fails to specifically teach of (1) writes in the second storage area the data written in the first storage area and update information relating to the data written in the first storage area. However, Wahl teaches of writes in the second storage area the data

written in the first storage area and update information relating to the data written in the first storage area (FIG. 1; FIG. 3; column 9, lines 12 – 40; where whenever a call is made that will modify data on the local data device (the first storage area), a copy of that data is placed on both the local data device and the writelog device (the second storage area) and a metadata header for that data update (update information) is stored in the writelog device).

11. With respect to claim 4, Nakano and Wahl teach of all the limitations of the parent claims, as discussed supra. Nakano fails to specifically teach of (1) wherein the first storage system generates, upon receiving from the host device the data write request, an update number that is used for identifying a data update order, and (2) includes the update number in the data write request that is sent to the second storage system, (3) wherein the update information written in the second storage area includes the update number.

However, Wahl teaches of wherein the first storage system generates, upon receiving from the host device the data write request, an update number that is used for identifying a data update order (FIG. 1; FIG. 3; column 7, lines 18 – 21; column 9, lines 12 – 40; where the device driver creates the metadata header for the data update after receiving a call to modify data on the data device. The header contains a global sequence number and a local sequence number which are used to ensure that the order of data entries in the writelog follows the sequence they are generated), and

includes the update number in the data write request that is sent to the second storage system (FIG. 1; FIG. 3; FIG. 5; column 7, lines 18 – 21; column 9, lines 29 – 40;

column 10, lines 11 – 23; where the primary mirror daemon monitors the writelog device for data updates and sends them to the mirror device (the second storage system; sending data updates is the data write request for the mirror device) to be stored. The data updates contain a header for the updated data as created by the device driver that includes sequence numbers (update numbers). Therefore, the sequence numbers in the header are sent in a write request along with the updated data to the mirror device),

wherein the update information written in the second storage area includes the update number (FIG. 1; FIG. 3; FIG. 5; column 7, lines 18 – 21; column 9, lines 12 – 40; column 10, lines 11 – 23; where the header (update information) containing the sequence numbers is stored in the writelog device (second storage area)).

Nakano and Wahl are analogous arts as they are both in the same field of endeavor, remote data backup. It would have been obvious to one of ordinary skill in the art having the teachings of Nakano and Wahl at the time of the invention to include the primary and remote mirror daemons from Wahl in the data centers of Nakano to aide in controlling data transfer processes. The motivation for this would have been to allow for the system to operate over multiple different network configurations and be compatible with varieties of disk storage devices (Wahl column 2, line 66 – column 3, line 8).

12. With respect to claim 5, Nakano and Wahl teach of all the limitations of the parent claims, as discussed supra. Nakano also teaches of wherein the second storage system sends, upon receiving from the first storage system the data write request, the write response to the first storage system (FIG. 5; paragraph 0065 – 0066; where the

updated data block (write instruction) is sent to the storage sub-system 2 (second storage system) from the storage sub-system 1 (first storage system). After writing the data in the storage sub-system 2 a write end is transmitted to the storage sub-system 1 by the storage sub-system 2),

writes in the third storage area the data sent from the first storage system (FIG. 5; FIG. 2; paragraph 0065 – 0066; paragraph 0099 – 0104; where the data block is written in the one of the disk drives in storage sub-system 2 (third storage area) by the disk adaptor within the storage sub-system), and

Nakano fails to specifically teach of (1) writes in the fourth storage area the data written in the third storage area, (2) update information relating to the data written in the third storage area. However, Wahl teaches of writes in the fourth storage area the data written in the third storage area (FIG. 1; FIG. 3; column 9, lines 12 – 40; where whenever a call is made that will modify data on the data device, a copy of that data is placed on both the local data device (third storage area) and the writelog device (fourth storage area)),

update information relating to the data written in the third storage area (FIG. 1; FIG. 3; column 9, lines 12 – 40; where whenever a call is made that will modify data on the data device, a copy of that data is placed on both the local data device and the writelog device and a header (update information) for that data update is stored in the writelog device (fourth storage area)).

13. With respect to claim 6, Nakano and Wahl teach of all the limitations of the parent claims, as discussed supra. Nakano fails to specifically teach of (1) wherein the

second storage system obtains an update number that is included in the data write request sent from the first storage system to be used for identifying a data update order, (2) wherein the update information written in the fourth storage area includes the update number obtained by the second storage system.

However, Wahl teaches of wherein the second storage system obtains an update number that is included in the data write request sent from the first storage system to be used for identifying a data update order (FIG. 1; FIG. 3; FIG. 5; column 7, lines 18 – 21; column 9, lines 29 – 40; column 10, lines 11 – 23; where the primary mirror daemon monitors the writelog device for data updates and sends the data updates to the mirror device (the second storage system; the sending them is the data write request for the mirror device). The data updates are stored in the mirror device. The data updates contain a header for the updated data as created by the device driver. The headers include sequence numbers (update numbers). Therefore the mirror device has obtained the sequence numbers),

wherein the update information written in the fourth storage area includes the update number obtained by the second storage system (FIG. 1; FIG. 3; FIG. 5; column 9, lines 29 – 40; column 10, lines 11 – 23; where the data updates are sent to the mirror device (the second storage system, fourth storage area) and are stored in the mirror device. It is clear that the mirror device (fourth storage area) contains the updated data which gives the mirror device a duplicate of the data stored in the data device, as well as the header for the updated data. The header for the update as created by the device driver includes the sequence numbers (update numbers)).

14. With respect to claim 7, Nakano and Wahl teach of all the limitations of the parent claim, as discussed supra. Nakano also teaches of wherein data writing in the first storage area in the first storage system is performed asynchronously with data writing in the sixth storage area in the third storage system (FIG. 1, 2, 6, 9; paragraph 0079, paragraph 0081; paragraph 0092; where data center 1 receives updated data from the host and data center 3 located at a remote location receives the updated data using the asynchronous remote copying technique. It is clear that the since data transfer to the first and third storage sub-systems is asynchronous, that data transfer to the hard disks within storage sub-systems 1 and 3 (first storage area and sixth storage area, respectively) is also asynchronous since the transferred data is stored therein).

15. With respect to claim 8, Nakano and Wahl teach of all the limitation of the parent claims, as discussed supra. Nakano teaches of

wherein the first storage system sends to the third storage system the data (FIG. 1; FIG. 2; paragraph 0078 – 0081; where the updated data received by data center 1 (first storage system) is transmitted to the storage sub-system of the remote data center which is data center 3 (third storage system)) and

the third storage system writes in the fifth storage area the data (FIG. 1; FIG. 2; paragraph 0078 – 0081; paragraph 0099 – 0105; where the data received by data center 3 is temporarily stored in the cache and then written to one of the hard disks in storage sub-system 3, the fifth storage area) and

Nakano fails to specifically teach of (1) the update information relating to the data written in the second storage area, and (2) the update information relating thereto sent

from the first storage system, and (3) writes in the sixth storage area data generated based on the data and the update information relating thereto written in the fifth storage area. However, Wahl teaches of the update information relating to the data written in the second storage area (FIG. 1; FIG. 3; FIG. 5; column 10, lines 11 – 24; where the primary mirror daemon sends data updates to the remote mirror device (third storage system, fifth storage area). The updates, taken from the writelog device (the second storage area within the first storage system), contain the metadata header, update information), and

the update information relating thereto sent from the first storage system (FIG. 1; FIG. 3; FIG. 5; column 10, lines 11 – 24; where the remote mirror device sends an acknowledgement of receipt confirming that the data updates have been committed to the mirror device, via the remote mirror daemon. Therefore the header (update information) and updated data have been stored), and

writes in the sixth storage area data generated based on the data and the update information relating thereto written in the fifth storage area (FIG. 1; FIG. 3; column 6, lines 41 – 57; column 7, lines 18 – 21; column 9, lines 12 – 40; the data stored in the sixth storage area is no different then the data stored in the fifth area. They are merely copies of each other. It is obvious to one of ordinary skill in the art having one set of data on a hard drive to create a copy of that data on another hard drive so that in the event of a failure, the second drive can be accessed for the data in place of the first drive (Wahl, column 1, lines 44 – 50)).

16. With respect to claim 10, Nakano and Wahl teach of all the limitations of the parent claims, as discussed supra. Nakano fails to teach of (1) wherein the first storage system generates, upon receiving a data write request from the host device, an update number that is used for identifying a data update order, (2) wherein the update information written in the second storage area in the first storage system includes the update number generated by the first storage system.

However, Wahl teaches of wherein the first storage system generates, upon receiving a data write request from the host device, an update number that is used for identifying a data update order (FIG. 1; FIG. 3; column 7, lines 18 – 21; column 9, lines 12 – 40; where the device driver creates the metadata header for the updated data after receiving a call to modify data on the data device. The header contains a global sequence number and a local sequence number which are used to ensure that the order of data entries in the writelog follows the sequence they are generated),

wherein the update information written in the second storage area in the first storage system includes the update number generated by the first storage system (FIG. 1; FIG. 3; column 7, lines 18 – 21; column 9, lines 12 – 40; where the header (update information) containing the sequence numbers is stored in the writelog device (second storage are)).

With respect to claim 11, Nakano and Wahl teach of all the limitations of the parent claims, as discussed supra. Nakano fails to teach of (1) wherein the update information written in the fifth storage area in the third storage system includes an update number that is used for identifying a data order number.

However, Wahl teaches of wherein the update information written in the fifth storage area in the third storage system includes an update number that is used for identifying a data order number (column 7, lines 18 – 21; column 9, lines 12 – 40; column 10, lines 11 – 24; where the data updates stored in the mirror device (the fifth storage area in the third storage system) contain a header as a part of the data update entry. The header contains sequence numbers used to keep the data entries in order).

17. With respect to claim 12, Nakano and Wahl teach of all the limitations of the parent claim, as discussed supra. Nakano fails to specifically teach of (1) wherein the first storage system includes a plurality of the first storage areas, (2) wherein the update information written in the second storage area is created for data that is written in the plurality of the first storage areas.

However, Wahl teaches of wherein the first storage system includes a plurality of the first storage areas (FIG. 3; column 8, line 21 – column 9, line 11; column 12, lines 4 – 8; where the QDS2 device, data storage unit, contains multiple disks associated with the writelog device, and where it is possible to have a plurality of local data devices (first storage areas) to share a writelog device),

wherein the update information written in the second storage area is created for data that is written in the plurality of the first storage areas (FIG. 3; column 7, lines 18 – 21; column 9, lines 12 – 40; where a header is created for the data update that is added to the writelog device and stored in the associated storage areas).

Nakano and Wahl are analogous arts as they are both in the same field of endeavor, remote data backup. It would have been obvious to one of ordinary skill in

the art having the teachings of Nakano and Wahl at the time of the invention to reserve multiple hard drives in Nakano as is done in Wahl and assign them a specific writelog device to store updated data and a header corresponding to the data in the data hard drives as in Wahl. The motivation for this would have been to allow for the use of RAID technology in storing the data as an additional redundancy mentioned in column 1, lines 27 – 34 of Wahl and hinted at, yet not explained in Nakano in the "Configuration of a Storage Sub-system" section, starting at paragraph 0096.

18. With respect to claim 13, Nakano and Wahl teach of all the limitations of the parent claim, as discussed supra. Nakano fails to specifically teach of (1) wherein the second storage system includes a plurality of the third storage areas, (2) wherein the update information written in the fourth storage area is created for data that is written in the plurality of the third storage areas.

However, Wahl teaches of wherein the second storage system includes a plurality of the third storage areas (FIG. 3; column 8, line 21 – column 9, line 11; column 12, lines 4 – 8; where the QDS2 device, data storage unit, contains multiple disks associated with the writelog device, and where it is possible to have a plurality of data devices (third storage areas) to share a writelog device),

wherein the update information written in the fourth storage area is created for data that is written in the plurality of the third storage areas (wherein the update information written in the second storage area is created for data that is written in the plurality of the first storage areas (FIG. 3; column 7, lines 18 – 21; column 9, lines 12 –

40; where a header is created for the data update that is added to the writelog device and stored in the associated storage areas).

19. With respect to claim 14, Nakano and Wahl teach of all the limitations of the parent claim, as discussed supra. Nakano fails to specifically teach of (1) wherein the third storage system includes a plurality of the sixth storage areas, (2) wherein data that is written in the plurality of the sixth storage areas is generated based on data and update information relating to the data written in the fifth storage area.

However, Wahl teaches of wherein the third storage system includes a plurality of the sixth storage areas (FIG. 3; column 8, line 21 – column 9, line 11; where the QDS0 device, data storage unit, contains multiple writelog devices associated with the data disk),

wherein data that is written in the plurality of the sixth storage areas is generated based on data and update information relating to the data written in the fifth storage area (FIG. 1; FIG. 3; column 6, lines 41 – 57; column 7, lines 18 – 21; column 9, lines 12 – 40; the data stored in the sixth storage area is no different then the data stored in the fifth area. They are merely copies of each other. It is obvious to one of ordinary skill in the art having one set of data on a hard drive to create a copy of that data on another hard drive so that in the event of a failure, the second drive can be accessed for the data in place of the first drive (Wahl, column 1, lines 44 – 50)).

20. With respect to claim 15, Nakano and Wahl teach of all the limitations of the parent claim, as discussed supra. Nakano teaches of copying data from the hard drives in storage sub-system 1 (storage areas 1 and 2) to the hard drives of storage sub-

systems 2 and 3 (storage areas 3, 4 and 5, 6 respectively), FIG. 1 – 2; paragraph 0061 –0070; paragraph 0077 – 0081; paragraph 0099 – 107.

Nakano fails to specifically teach of (1) wherein the update information written in the second storage area in the first storage system includes an update number that is generated by the first storage system to be used for identifying a data update order, (2) the update information written in the fourth storage area in the second storage system includes the update number included in the update information written in the second storage area, and (3) the update information written in the fifth storage area in the third storage system includes the update number included in the update information written in the second storage area.

However, Wahl teaches of wherein the update information written in the second storage area in the first storage system includes an update number that is generated by the first storage system to be used for identifying a data update order (FIG. 1 – 3; column 7, lines 18 – 21; column 9, lines 12 – 40; where the device driver creates sequence numbers located in the metadata header with the updated data. The sequence numbers are used to ensure that the order of the data entries is proper. The header (update information) is then stored in the writelog device with the updated data),

the update information written in the fourth storage area in the second storage system includes the update number included in the update information written in the second storage area (FIG. 1 – 3; column 7, lines 18 – 21; column 9, lines 12 – 40; where the header (update information) is stored in the writelog device with the updated data), and

the update information written in the fifth storage area in the third storage system includes the update number included in the update information written in the second storage area (FIG. 1 – 3; column 7, lines 18 – 21; column 9, lines 12 – 40; where the header (update information) is stored in the writelog device with the updated data).

Nakano and Wahl are analogous arts as they are both in the same field of endeavor, remote data backup. Wahl teaches of storing sequence numbers in a header (update data) associated with the updated data in the writelog device. It would have been obvious to one of ordinary skill in the art having the teachings of Nakano and Wahl at the time of the invention to modify the multiple storage sub-systems of Nakano to include the datastar device driver of Wahl into each controller within each storage sub-system, set aside a hard drive or hard drives inside each of the storage sub-systems of Nakano to store writelog data that is associated with the updated data stored in corresponding hard disks, and include the processes of reading, and writing them as described in Wahl in with copying data between the storage sub-systems in Nakano. Thereby storing the sequence numbers, created by the device driver in storage subsystem 1, in storage areas 2, 4, and 5 along with the writelog information. The motivation for this would have been to ensure that the data stored in the hard drives set aside for data (versus hard drives for writelog information) can be brought up to date (by the writelog information) in the event to a system crash, Wahl column 3, line 45 – column 4, line 3.

21. With respect to claim 16, Nakano teaches of a data processing system comprising: a first storage system that is connected to a first host device and sends and

receives data to and from the first host device (FIG. 5 FIG. 29; paragraph 0061; paragraphs 0065 – 0066 paragraph 0255; where the host 1 transmits an instruction (data) to storage sub-system 1 and storage sub-system 1 transmits a response back to host 1);

a second storage system that is connected to a second host device and the first storage system and receives data from the first storage system (FIG. 1; FIG. 5; FIG. 29; paragraphs 0065 – 0066; paragraphs 0079; paragraph 0255; where the storage sub-system 2 (second storage system) is connected to a second host, and where the storage sub-system 2 exchanges data with storage sub-system 1 (first storage system) through synchronous transmission showing that they are connected to each other and that the second storage sub-system can receive data from the first); and

a third storage system that is connected to the first storage system and receives data from the first storage system (FIG. 1; paragraph 0079; where the data center 3 (third storage system) and the data center 1 (first storage system) can exchange data through an asynchronous remote copying technique. Therefore they are connected and data center 3 can receive data from the first),

wherein the first storage system includes a first storage area that stores data sent from the first host device (FIG. 1; FIG. 2; paragraph 0100 – 0104; where data received from the host is temporarily stored in the cache and then transferred to the hard disk drive located in the storage sub-system 1 (first storage area)), and

the second storage system includes a third storage area that stores data sent from the first storage system (FIG. 1; FIG. 2; paragraph 0100 – 0107; paragraph 0078 –

0080; where the storage sub-system 3 (third storage system) contains a channel adaptor for the exchange of data by a host or remote copy destination (second storage area), a cache memory used for temporarily storing the data exchanged, and a hard disk drive (fifth storage area) where the data temporarily stored in the cache is written. The data sent to the hard disk drive (fifth storage area) is from storage sub-system 1 (first storage system) from an asynchronous transfer operation shown in FIG. 1), and

the third storage system includes a fifth storage area that stores data read from the second storage area (FIG. 1; FIG. 2; paragraph 0100 – 0107; paragraph 0078 – 0080; where the storage sub-system 2 (second storage system) contains a channel adaptor for the exchange of data by a host or remote copy destination (first storage system), a cache memory used for temporarily storing the data exchanged, and a hard disk drive (third storage area) where the data temporarily stored in the cache is written. The data sent to the hard disk drive (third storage area) is from storage sub-system 1 (first storage system) from a synchronous transfer operation shown in FIG. 1).

Nakano fails to specifically teach of (1) a second storage area that stores the data written in the first storage area and update information relating to the data written in the first storage area, (2) a fourth storage area that stores the data written in the third storage area and update information relating to the data written in the third storage area, and (3) update information relating to the data read from the second storage area, and (4) a sixth storage area that stores data that is generated based on the data written in the fifth storage area and the update information relating to the data written in the fifth storage area.

However, Wahl teaches of a second storage area that stores the data written in the first storage area and update information relating to the data written in the first storage area (FIG. 1; FIG. 3; column 6, lines 41 – 57; column 7, lines 18 – 21; column 9, lines 12 – 40; where a writelog device (second storage area) that is a hard drive that is associated with each local data device (first storage area) that stores the modified data put on the local device and a header (update information) that is related to that data),

a fourth storage area that stores the data written in the third storage area and update information relating to the data written in the third storage area (FIG. 1; FIG. 3; column 6, lines 41 – 57; column 7, lines 18 – 21; column 9, lines 12 – 40; where a writelog device (fourth storage area) that is a hard drive that is associated with each local data device (third storage area) that stores the modified data put on the local device and a header (update information) that is related to that data), and

update information relating to the data read from the second storage area (FIG. 1; FIG. 3; column 6, lines 41 – 57; column 7, lines 18 – 21; column 9, lines 12 – 40; where a writelog device (fifth storage area) that is a hard drive stores the modified data put on the local device and a header (update data) related to that data), and

a sixth storage area that stores data that is generated based on the data written in the fifth storage area and the update information relating to the data written in the fifth storage area (FIG. 1; FIG. 3; column 6, lines 41 – 57; column 7, lines 18 – 21; column 9, lines 12 – 40; the data stored in the sixth storage area is no different then the data stored in the fifth area. They are merely copies of each other. It is obvious to one of ordinary skill in the art having one set of data on a hard drive to create a copy of that

data on another hard drive so that in the event of a failure, the second drive can be accessed for the data in place of the first drive (Wahl, column 1, lines 44 – 50)).

22. With respect to claim 17, Nakano and Wahl teach of all the limitations of the parent claim, as discussed supra. Nakano teaches of copying data from the hard drives in storage sub-system 1 (storage areas 1 and 2) to the hard drives of storage sub-systems 2 and 3 (storage areas 3, 4 and 5, 6 respectively), FIG. 1 – 2; paragraph 0061 –0070; paragraph 0077 – 0081; paragraph 0099 – 107.

Nakano fails to specifically teach of (1) wherein the update information written in the second storage area in the first storage system includes an update number that is generated by the first storage system to be used for identifying a data update order, (2) the data update information written in the fourth storage area in the second storage system includes the update number included in the data update information written in the second storage area, (3) the data update information written in the fifth storage area in the third storage system includes the update number included in the data update information written in the second storage area.

However, Wahl teaches of wherein the update information written in the second storage area in the first storage system includes an update number that is generated by the first storage system to be used for identifying a data update order (FIG. 1 – 3; column 7, lines 18 – 21; column 9, lines 12 – 40; where the device driver creates sequence numbers located in the metadata header with the updated data. The sequence numbers are used to ensure that the order of the data entries is proper. The header (update information) is stored in the writelog device with the updated data),

the data update information written in the fourth storage area in the second storage system includes the update number included in the data update information written in the second storage area (FIG. 1 – 3; column 7, lines 18 – 21; column 9, lines 12 – 40; where the header (update information) is stored in the writelog device with the updated data), and

the data update information written in the fifth storage area in the third storage system includes the update number included in the data update information written in the second storage area (FIG. 1 – 3; column 7, lines 18 – 21; column 9, lines 12 – 40; where the header (update information) is stored in the writelog device with the updated data).

Nakano and Wahl are analogous arts as they are both in the same field of endeavor, remote data backup. Wahl teaches of storing sequence numbers in a header (update data) associated with the updated data in the writelog device. It would have been obvious to one of ordinary skill in the art having the teachings of Nakano and Wahl at the time of the invention to modify the multiple storage sub-systems of Nakano to include the datastar device driver of Wahl into each controller within each storage sub-system, set aside a hard drive or hard drives inside each of the storage sub-systems of Nakano to store writelog data that is associated with the updated data stored in corresponding hard disks, and include the processes of reading, and writing them as described in Wahl in with copying data between the storage sub-systems in Nakano. Thereby storing the sequence numbers, created by the device driver in storage subsystem 1, in storage areas 2, 4, and 5 along with the writelog information. The

motivation for this would have been to ensure that the data stored in the hard drives set aside for data (versus hard drives for writelog information) can be brought up to date (by the writelog information) in the event to a system crash, Wahl column 3, line 45 – column 4, line 3.

23. With respect to claim 18, Nakano and Wahl teach of all the limitations of the parent claims, as discussed supra. Nakano also teaches of wherein, when the first storage system fails (FIG. 2; FIG. 8; paragraph 0170; where a blockage (failure) has occurred in the controller of the storage sub-system 1, which causes the copying process to cease),

the third storage system sends to the second storage system latest update information relating to the update information written in the fifth storage area (FIG. 2 – 4, 8; paragraph 0172 – 0177; where the controller of storage sub-system 3 compares the values in the bit map (bit map #5, i.e. update information in fifth storage area) with the values in the acknowledgement command. Based on those comparisons, the counter values are decremented of the corresponding block number in the bit map #5. The controller of storage sub-system 3 transmits the results of this (update information relating to the update information (bit map #5) in the fifth storage area) to the controller of the storage sub-system 2), and

the second storage system judges, based on the latest update information sent from the third storage system and by using data written in the fourth storage area, as to whether data update for the fifth storage area in the third storage system is possible (FIG. 2 – 4, 8; paragraph 0177 – 0178; where the controller of storage sub-system 2

receives the response from the controller of storage sub-system 3, it can see in the bit map for storage sub-system 2 (bit map #4, i.e. update data stored in the fourth storage area), if the response indicates a decremented counter value. If so, it shows that the data is different between storage sub-systems 2 and 3, thus it is possible to update the data).

24. With respect to claim 28, Nakano and Wahl teach of all the limitations of the parent claims, as discussed supra. Nakano also teaches of wherein, when the first storage system fails (FIG. 2; FIG. 8; paragraph 0170; where a blockage (failure) has occurred in the controller of the storage sub-system 1, which causes the copying process to cease),

the third storage system sends to the second storage system latest update information relating to the update information written in the fifth storage area (FIG. 2 – 4, 8; paragraph 0172 – 0177; where the controller of storage sub-system 3 compares the values in the bit map (bit map #5, i.e. update information in fifth storage area) with the values in the acknowledgement command. Based on those comparisons, the counter values are decremented of the corresponding block number in the bit map #5. The controller of storage sub-system 3 transmits the results of this (update information relating to the update information (bit map #5) in the fifth storage area) to the controller of the storage sub-system 2), and

the second storage system judges, based on the latest update information sent from the third storage system and by using data written in the third storage area, as to whether data update for the fifth storage area in the third storage system is required

(FIG. 2 – 4, 8; paragraph 0177 – 0178; where the controller of storage sub-system 2 receives the response from the controller of storage sub-system 3, it can see in the bit map for storage sub-system 2 (bit map #4, i.e. update data stored in the third storage area), if the response indicates a decremented counter value. If so, it shows that the data is different between storage sub-systems 2 and 3, thus it is required to update the data).

25. With respect to claim 29, Nakano and Wahl teach of all the limitations of the parent claim, as discussed supra. Nakano also teaches of wherein when the first storage system fails (FIG. 2; FIG. 7, 8; paragraph 0170; where a blockage (failure) has occurred in the controller of the storage sub-system 1 (first storage system), which causes the copying process to cease),

the second storage system controls to stop wiring data sent from the first storage system in the third storage area (FIG. 29; paragraph 0170; paragraph where copying using synchronous or asynchronous transfer is not continued, thus stopping the storage sub-system 2 (second storage system) from writing data), and

to write data sent from the second host device in the third storage area (FIG. 25, 29; paragraph 0255 – 0262; paragraph 0246; where the storage sub-system 2 (second storage system) becomes the primary system and its sub-host, sub-host 2, operates as a proxy. As the sub-host 2 takes the role of the primary host and the sub-system 2 becomes the primary sub-system, sub-system 2 now receives data from sub-host 2 and stores it in one of its hard disks (third storage area) just as sub-system 1 did), and

the first storage system controls to stop wiring data sent from the first host device in the first storage area (FIG. 25, 29; paragraph 0255 – 0262; paragraph 0246; where the storage sub-system 2 and sub-host 2 assume the role of storage sub-system 1 and host 1. Since sub-host 2 has taken over for host 1, it is clear that sub-system 1 is no longer receiving data from host 1 and storing it in one of its hard disks (first storage area), and

to write data sent from the second storage system in the first storage system (FIG. 25, 29; paragraph 0246 – 0247; paragraph 0255 – 0262; where when the storage sub-system 1 is recovered, all of the data in the storage sub-system 2 is copied to the storage sub-system 1).

26. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nakano and Wahl as applied to claim 8 above, and further in view of Kern et al., U.S. Patent No. 5,734,818 (hereinafter Kern).

27. With respect to claim 9, Nakano and Wahl teach of all the limitations of the parent claims, as discussed supra. Nakano and Wahl fail to teach of (1) wherein the third storage system controls to read at specified time intervals from the first storage system the data and the update information relating thereto written in the second storage area in the first storage system.

However, Kern teaches of wherein the third storage system controls to read at specified time intervals from the first storage system the data and the update information relating thereto written in the second storage area in the first storage system (FIG. 4 - 6, 10, 11; column 10, line 54 – column 11, line 7; column 11, line 37 – 51;

column 12, line 37 – 67; column 15, lines 7 – 36; column 16, lines 17 – 27; where in step 1040 the primary data mover (PDM) reads the record set information captures (i.e. stored) in each primary storage controller (second storage area). A read record set is called by the PDM based on an interrupt set off of a predetermined time interval. The record set contains update specific information including the specific record (data) updates. The PDM transmits the journaled record sets to the secondary data mover (SDM) in step 1060. They are reassembled into their consistency groups to ensure the integrity of the data and then written to the secondary DASD (third storage system) in step 1160. Since the record sets are only received from the controllers at predetermined time intervals, the whole process occurs at those time intervals therefore the record updates and record set information is received/read by the secondary controllers (third storage system) at the same intervals).

The combination of Nakano and Wahl, and Kern are analogous arts as they in the same field of endeavor, remote data backup. It would have been obvious to one of ordinary skill in the art having the teachings of Nakano, Wahl, and Kern at the time of the invention to incorporate the process of reading the record set data from the controllers at predetermined intervals, thusly grouping the data based on the intervals, from the data movers in Kern into the controllers in the combination of Nakano and Wahl. The motivation for this would have been to limit the number of input/output commands which would in turn allow the secondary DASDs to closer shadow (or mirror) the record updates at the primary site (Kern, column 16, lines 54 – 61).

Allowable Subject Matter

28. Claims 19 – 27, and 30 – 40 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

29. The following is a statement of reasons for the indication of allowable subject matter:

a. With respect to claim 19, the prior art (specifically, Nakano) teaches of the third storage system determines data that is not written in the fifth storage area and update information relating thereto based on the update information relating thereto written in the fourth storage area in the second system, but does not teach of the data stored in the fourth storage area, or determining data that is not written in the fifth storage area based off of the data in the fourth storage area as claim 19 does.

b. With respect to claims 20 – 27, the prior art (specifically, Nakano) teaches of the third storage system controls to read from the second storage system data that is not written in the fifth storage area and update information relating thereto among the update information relating thereto written in the fourth storage area in the second storage system, but does not teach of the data stored in the fourth storage area, or reading from the data stored in the fourth storage area as claim 20 does.

c. With respect to claim 30 – 40, the prior art, (specifically, Nakano) fails to teach of the third storage system reads data from the fourth storage area in the

second storage system, and writes the data read from the fourth storage system as claim 30 does. Nakano teaches of reading the bit map (update information) from the fourth storage area, and reading the data from the third storage area, not the fourth storage area.

Conclusion

30. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

31. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael C. Krofcheck whose telephone number is 571-272-8193. The examiner can normally be reached on Monday - Friday.

31. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matt Kim can be reached on 571-272-4182. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

32. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Michael Krofcheck

MATTHEW D. ANDERSON
PRIMARY EXAMINER